

## Effect of oxidizing or reducing Boom Clay on its interactions with uranium

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Boom Clay (according the Dutch nomenclature the Rupel Clay Member) is a potential host rock for disposal of radioactive waste in the Netherlands. Here, we added U(VI) to Boom Clay suspensions and investigated the kinetics of U partitioning. X-ray absorption spectroscopy was used to characterize the solid-bound U. The redox properties of Boom Clay might vary within the formation and can be altered during construction and operation of the repository. Therefore, this study focusses on the effect of oxidation or reduction of Boom Clay on its interactions with U. Oxidation and reduction of Boom Clay was achieved by treatment with H<sub>2</sub>O<sub>2</sub> and BH<sub>4</sub><sup>-</sup>, respectively. The consequence of these treatments were investigated using sequential Fe extractions and mediated electrochemical analysis. In order to separate the effect of redox alterations on the various redox active constituents in Boom Clay, experiments were performed with the isolated clay and silt fraction.

With unaltered Boom Clay, dissolved U concentration decrease with time, faster in experiments with separated clay or silt fraction than with total Boom Clay. Irrespective of particle size, dissolved U concentrations reached a steady state of around 10<sup>-6</sup> M after 10 days reaction time. Based on linear combination of spectra of U(VI) and U(IV) reference samples (X-ray absorption near edge structure, XANES), about 75% of the solid-bound U was in the form of U(IV).

The extent of U(VI) reduction by Boom Clay, which was treated with BH<sub>4</sub><sup>-</sup>, was not significantly higher compared to untreated Boom Clay but the removal of dissolved U from solution proceeded faster. Oxidation of Boom Clay also accelerated the initial removal of dissolved U. However, the final concentrations of dissolved U were around 10<sup>-5</sup> M and thus higher compared to unaltered or reduced Boom Clay. Analysis of the XANES spectra indicates that adsorption of U(VI) was the dominant processes for removing U from solution with oxidized Boom Clay. In the presentation, the connection between the changes in Fe speciation, electrochemical properties, and the interactions with U, due to the redox treatment of Boom Clay, will be discussed.